

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
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# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

**11 FEB 2005**

Applicant's or agent's file reference

08321-0148 PC1

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

PCT/US04/20464

International filing date (day/month/year)

25 June 2004 (25.06.2004)

Priority date (day/month/year)

27 June 2003 (27.06.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): C12Q 1/68; C12P 19/34; C07H 21/04 and US Cl.: 435/6, 91.1, 91.2; 536/24.3

Applicant

THOMAS JEFFERSON UNIVERSITY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US04/20464

**Box No. I Basis of this opinion**

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US04/20464

**Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims <u>1-42</u>	YES
	Claims <u>NONE</u>	NO
Inventive step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-42</u>	NO
Industrial applicability (IA)	Claims <u>1-42</u>	YES
	Claims <u>NONE</u>	NO

**2. Citations and explanations:**

Claims 1-42 lack an inventive step under PCT Article 33(3) as being obvious over Brenner et al. in view of Cao et al. These claims are drawn to methods and kits relating to nucleic acid detection via ligase reaction of adjacent hybridization probes, use of "barcodes" or sequence tags, and use of detection probes labeled with a detectable label and a nanoparticle. Brenner et al. disclose an assay wherein adjacent hybridization probes are ligated on a target nucleic acid, and one of said probes has a "barcode" or sequence tag which is used to bind a hybridization complex to an array surface, which surface comprises a nucleic acid with the complement of the barcode (see Fig. 3 and columns 33-34). Brenner et al. do not teach a detection probe comprising a different barcode, a nanoparticle, and a detectable label; in Brenner et al., the other one of the ligation probes comprises a detectable label. Cao et al. teach the use of detection probes in sandwich hybridization assays, which probes comprise nanoparticles and dye labels useful with Raman detection systems (see especially page 1537). One of ordinary skill in the art would have been motivated to modify the barcode-ligation assay of Brenner et al. by using a detection system based on probes comprising a label and a nanoparticle because Cao et al. taught the benefits of such a probe, specifically with respect to sensitivity, selectivity, and ratioing and multiplexing capability.

Claims 1-42 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.